



SLOVENSKI STANDARD SIST EN ISO 17636-2:2013

01-september-2013

Nadomešča:

SIST EN 1435:1998

SIST EN 1435:1998/A1:2003

SIST EN 1435:1998/A2:2004

Neporušitvene preiskave zvarnih spojev - Radiografske preiskave - 2. del : X- in gama žarki z uporabo digitalnih detektorjev (ISO 17636-2:2013)

Non-destructive testing of welds - Radiographic testing - Part 2: X- and gamma-ray techniques with digital detectors (ISO 17636-2:2013)

Zerstörungsfreie Prüfung von Schweißverbindungen - Durchstrahlungsprüfung - Teil 2: Röntgen- und Gammastrahlungstechniken unter Anwendung digitaler Detektoren (ISO 17636-2:2013)

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

Contrôle non destructif des assemblages soudés - Contrôle par radiographie - Partie 2: Techniques par rayons X ou gamma à l'aide de détecteurs numériques (ISO 17636-2:2013)

Ta slovenski standard je istoveten z: EN ISO 17636-2:2013

ICS:

25.160.40 Varjeni spoji in vari Welded joints

SIST EN ISO 17636-2:2013

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 17636-2:2013

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 17636-2

January 2013

ICS 25.160.40

Supersedes EN 1435:1997

English Version

**Non-destructive testing of welds - Radiographic testing - Part 2:
X- and gamma-ray techniques with digital detectors (ISO 17636-
2:2013)**

Contrôle non destructif des assemblages soudés - Contrôle
par radiographie - Partie 2: Techniques par rayons X ou
gamma à l'aide de détecteurs numériques (ISO 17636-
2:2013)

Zerstörungsfreie Prüfung von Schweißverbindungen -
Durchstrahlungsprüfung - Teil 2: Röntgen- und
Gammastrahlungstechniken mit digitalen Detektoren (ISO
17636-2:2013)

This European Standard was approved by CEN on 14 December 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....3

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

SIST EN ISO 17636-2:2013

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

Foreword

This document (EN ISO 17636-2:2013) has been prepared by Technical Committee CEN/TC 121 "Welding" the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1435:1997.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 17636-2:2013](https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013)

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 17636-2:2013

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

INTERNATIONAL STANDARD

ISO
17636-2

First edition
2013-01-15

Non-destructive testing of welds — Radiographic testing —

Part 2:

X- and gamma-ray techniques with digital detectors

iTeh STANDARD PREVIEW
(standards.iteh.ai)

*Contrôle non destructif des assemblages soudés — Contrôle par
radiographie —*

*Partie 2: Techniques par rayons X ou gamma à l'aide de détecteurs
numériques*

SIST EN ISO 17636-2:2013

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>



Reference number
ISO 17636-2:2013(E)

© ISO 2013

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN ISO 17636-2:2013](https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013)

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and terms	5
5 Classification of radiographic techniques.....	6
6 General	7
6.1 Protection against ionizing radiation	7
6.2 Surface preparation and stage of manufacture	7
6.3 Location of the weld in the radiograph	8
6.4 Identification of radiographs	8
6.5 Marking	8
6.6 Overlap of digital images.....	8
6.7 Types and positions of image quality indicators (IQI)	8
6.8 Minimum image quality values	9
6.9 Personnel qualification.....	10
7 Recommended techniques for making digital radiographs.....	10
7.1 Test arrangements	10
7.2 Choice of tube voltage and radiation source.....	16
7.3 Detector systems and metal screens.....	18
7.4 Alignment of beam	20
7.5 Reduction of scattered radiation	20
7.6 Source-to-object distance	22
7.7 Geometric magnification technique	25
7.8 Maximum area for a single exposure	26
7.9 Processing	26
7.10 Monitor viewing conditions and storage of digital radiographs	27
8 Examination report.....	28
Annex A (normative) Recommended number of exposures which give an acceptable examination of a circumferential butt weld	30
Annex B (normative) Minimum image quality values	35
Annex C (normative) Determination of basic spatial resolution.....	41
Annex D (normative) Determination of minimum grey values for CR practice	45
Annex E (informative) Grey values, general remarks.....	50
Bibliography.....	52

ISO 17636-2:2013(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17636-2 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition, together with ISO 17636-1, cancels and replaces ISO 17636:2003, of which it constitutes a technical revision.

ISO 17636 consists of the following parts, under the general title *Non-destructive testing of welds — Radiographic testing*:

- *Part 1: X- and gamma-ray techniques with film*
- *Part 2: X- and gamma-ray techniques with digital detectors*

The main changes are that:

- the normative references have been updated;
- the document has been divided into two parts — this part of ISO 17636 is applicable to radiographic testing with digital detectors;
- X-ray devices up to 1 000 kV have been included;
- Annex C on determination of basic spatial resolution has been added;
- Annex D on determination of minimum grey values for CR practice has been introduced;
- Annex E with general remarks on grey values has been added;
- the text has been editorially revised.

Requests for official interpretations of any aspect of this part of ISO 17636 should be directed to the Secretariat of ISO/TC 44/SC 5 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Introduction

This International Standard specifies fundamental techniques of radiography with the object of enabling satisfactory and repeatable results to be obtained economically. The techniques are based on generally recognized practice and fundamental theory of the subject, inspection of fusion welded joints with digital radiographic detectors.

Digital detectors provide a digital grey value image which can be viewed and evaluated with a computer only. The practice describes the recommended procedure for detector selection and radiographic practice. Selection of computer, software, monitor, printer and viewing conditions are important but are not the main focus of this part of ISO 17636.

The procedure specified in this part of ISO 17636 provides the minimum requirements and practice which permits exposure and acquisition of digital radiographs with equivalent sensitivity for detection of imperfections as film radiography, specified in ISO 17636-1.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN ISO 17636-2:2013](https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013)

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 17636-2:2013

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

Non-destructive testing of welds — Radiographic testing —

Part 2: X- and gamma-ray techniques with digital detectors

1 Scope

This part of ISO 17636 specifies fundamental techniques of digital radiography with the object of enabling satisfactory and repeatable results to be obtained economically. The techniques are based on generally recognized practice and fundamental theory of the subject.

This part of ISO 17636 applies to the digital radiographic examination of fusion welded joints in metallic materials. It applies to the joints of plates and pipes. Besides its conventional meaning, “pipe”, as used in this International Standard, covers other cylindrical bodies such as tubes, penstocks, boiler drums, and pressure vessels.

NOTE This part of ISO 17636 complies with EN 14784-2.[6]

This part of ISO 17636 specifies the requirements for digital radiographic X- and gamma-ray testing by either computed radiography (CR) or radiography with digital detector arrays (DDA) of the welded joints of metallic plates and tubes for the detection of imperfections.

Digital detectors provide a digital grey value (GV) image which can be viewed and evaluated using a computer. This part of ISO 17636 specifies the recommended procedure for detector selection and radiographic practice. Selection of computer, software, monitor, printer and viewing conditions are important, but are not the main focus of this part of ISO 17636. The procedure specified in this part of ISO 17636 provides the minimum requirements for radiographic practice which permit exposure and acquisition of digital radiographs with equivalent sensitivity for detection of imperfections as film radiography, as specified in ISO 17636-1.

This part of ISO 17636 does not specify acceptance levels for any of the indications found on the digital radiographs.

If contracting parties apply lower test criteria, it is possible that the quality achieved is significantly lower than when this part of ISO 17636 is strictly applied.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5576, *Non-destructive testing — Industrial X-ray and gamma-ray radiology — Vocabulary*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 16371-1:2011, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

ISO 17636-2:2013(E)

ISO 19232–1, *Non-destructive testing — Image quality of radiographs — Part 1: Image quality indicators (wire type) — Determination of image quality value*

ISO 19232–2, *Non-destructive testing — Image quality of radiographs — Part 2: Image quality indicators (step/hole type) — Determination of image quality value*

ISO 19232–4, *Non-destructive testing — Image quality of radiographs — Part 4: Experimental evaluation of image quality values and image quality tables*

ISO 19232–5, *Non-destructive testing — Image quality of radiographs — Part 5: Image quality indicators (duplex wire type) — Determination of image unsharpness value*

EN 12543 (all parts), *Non-destructive testing — Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing*

EN 12679, *Non-destructive testing — Determination of the size of industrial radiographic sources — Radiographic method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5576 and the following apply.

3.1
computed radiography
CR
storage phosphor imaging plate system
complete system comprising a storage phosphor imaging plate (IP) and a corresponding read-out unit (scanner or reader), which converts the information from the IP into a digital image

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 17636-2:2013](https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013)

3.2
storage phosphor imaging plate
IP

<https://standards.iteh.ai/catalog/standards/sist/e889514a-cb81-4b81-9e00-cf031402459e/sist-en-iso-17636-2-2013>

photostimulable luminescent material capable of storing a latent radiographic image of a material being examined and, upon stimulation by a source of red light of appropriate wavelength, generates luminescence proportional to radiation absorbed

NOTE When performing computed radiography, an IP is used in lieu of a film. When establishing techniques related to source size or focal geometries, the IP is referred to as a detector, i.e. source-to-detector distance (SDD).

3.3
digital detector array system
DDA system

electronic device converting ionizing or penetrating radiation into a discrete array of analogue signals which are subsequently digitized and transferred to a computer for display as a digital image corresponding to the radiologic energy pattern imparted upon the input region of the device

3.4
structure noise of imaging plate
structure noise of IP

structure due to inhomogeneities in the sensitive layer (graininess) and surface of an imaging plate

NOTE 1 After scanning of the exposed imaging plate, the inhomogeneities appear as overlaid fixed pattern noise in the digital image.

NOTE 2 This noise limits the maximum achievable image quality of digital CR images and can be compared with the graininess in film images.

3.5**structure noise of digital detector array****structure noise of DDA**

structure due to different properties of detector elements (pixels)

NOTE After read-out of the exposed uncalibrated DDA, the inhomogeneities of the DDA appear as overlaid fixed pattern noise in the digital image. Therefore, all DDAs require, after read-out, a software based calibration (software and guidelines are provided by the manufacturer). A suitable calibration procedure reduces the structure noise.

3.6**grey value****GV**

numeric value of a pixel in a digital image

NOTE This is typically interchangeable with the terms pixel value, detector response, analogue-to-digital unit, and detector signal.

3.7**linearized grey value****GV_{lin}**

numeric value of a pixel which is directly proportional to the detector exposure dose, having a value of zero if the detector was not exposed

NOTE This is typically interchangeable with the terms linearized pixel value, and linearized detector signal.

3.8**basic spatial resolution of a digital detector****SR_b^{detector}**

corresponds to half of the measured detector unsharpness in a digital image and corresponds to the effective pixel size and indicates the smallest geometrical detail, which can be resolved with a digital detector at magnification equal to one

NOTE 1 For this measurement, the duplex wire IQI is placed directly on the digital detector array or imaging plate.

NOTE 2 The measurement of unsharpness is described in ISO 19232-5, see also ASTM E2736^[13] and ASTM E1000.^[8]

3.9**basic spatial resolution of a digital image****SR_b^{image}**

corresponds to half of the measured image unsharpness in a digital image and corresponds to the effective pixel size and indicates the smallest geometrical detail, which can be resolved in a digital image

NOTE 1 For this measurement, the duplex wire IQI is placed directly on the object (source side).

NOTE 2 The measurement of unsharpness is described in ISO 19232-5, see also ASTM E2736,^[13] and ASTM E1000.^[8]

3.10**signal-to-noise ratio****SNR**

ratio of mean value of the linearized grey values to the standard deviation of the linearized grey values (noise) in a given region of interest in a digital image